UNITED KINGDOM ROCKETRY ASSOCIATION

10...9...8...

the voice of UKRA

volume 5 issue 3

IRW 2001

A compendium of personal reports

V0.5

Roy Trzeciak-Hicks' awesome scale L3 attempt

Video From Rockets

Technical article by Chris Eilbeck

SpaceShot 2000

Eye witness account of Ky Michaelson's altitude attempt by Richard Osborne

PLUS

Reviews, News and Competition results

Editorial

Events

After a slow start to the flying calendar things certainly burst into life over the summer. UKRA 2001, IRW 2001, the Canterbury Cup, and K-Lob 2001 (We hope to have a report in the next issue), not to mention the numerous EARS and other club launches, have given us the opportunity to fly all the rockets we could.

Articles

Begging again? Sure, but it's for the benefit of the newsletter. We've had a bumper crop of articals submitted recently. The temptation is to save them up so that we get a buffer for subsequent issues. Fortunately (or unfortunately depending on how you see it) we've managed to resist that temptation, and instead have boosted the size of the newsletter in recent issues. So, we're *still* short of articles!

Feedback

Even if you doen't feel able to contribute an article, how about an idea? What sort of articles would you like to see? Any ideas you have to make 10...9...8... better will be much appreciated. In fact any sort of feedback at all is extremely helpfull. Have you enjoyed recent issues? Which articles did you like? Which ones did you find dull or irellevant? If you let us know, we can steer the newsletter in directions the membership are interested in.

The Editor

Editorial Team
Content Editors | Pete & Angela Waddington
HTML Code Monkey | Darren J Longhorn

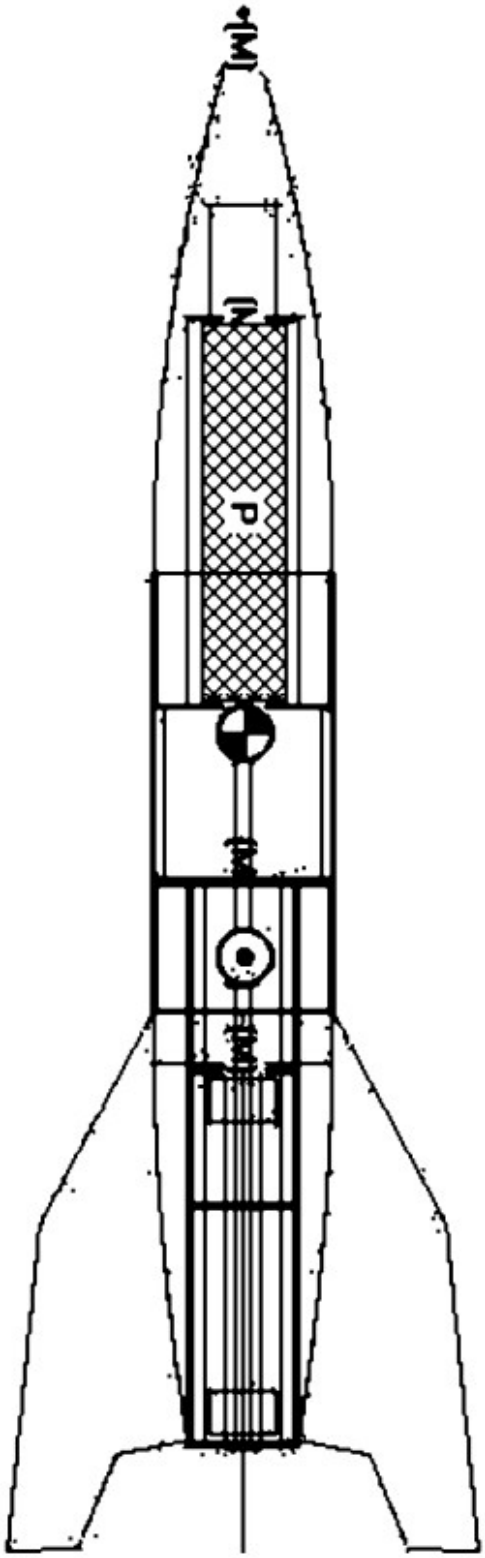
Newsletter Contacts
Submissions | newsletter@ukra.org.uk
Competitions | competition@ukra.org.uk

UKRA Contacts
Membership enquiries | membership@ukra.org.uk
General enquiries | enquiries@ukra.org.uk
Media enquiries | media@ukra.org.uk
Postal address | PO Box 1561, Sheffield, S11 7XA

Cover Photo: Pete Waddington's Estes Saturn V. *(Photo courtesy of Pete Waddington)*

Contents Photo: Not a photo at all, but a print of Roy's V2 Rocksim file.

Contents



Video From Rockets

by Chris Eilbeck

Once upon a time it took a lot of skill, dedication and effort to get video back from a rocket. Nowadays with the availability of cheap video senders operating at 2.4GHz anyone with enough skill to fly an altimeter can easily fly a video rocket.

First the legalities of this. You are allowed to transmit upto 10mW or 10dBm in the 2.4GHz band. It is not clear whether this is only ground based or from the air too. There is also a band at 1.3GHz which is unlicensed but while higher power is available in this band the equipment costs quite a bit more and is not so freely available.

What you cannot do is use one of those old video senders which you receive direct on your television, the ones with the long telescopic antenna. They transmit in the standard TV band and will radiate a long way from a few thousand feet up, potentially causing interference to a lot of people. Don't do it, this is very naughty.

Other frequencies or more power can also be used but you will need a Test and Development License from the Radiocommunications Agency which is only available at one site you specify and costs >£100 per year.

The Kit

So, what do you actually need to do this? The cheapest way is to get a 2.4GHz video sender by one of the mass market manufacturers like Thomson. Maplin also sell some good stuff as do places like Henry's Radio. This will give you a transmitter and receiver which typically run from 12v supplied by a plug-in mains transformer. Your transmitter will probably come attached to a patch antenna. Really you shouldn't change this.

If you're using a stock video sender you'll probably be using at least a 4" airframe. If you're interested in flying on smaller and cheaper motors there is a lot of stuff inside a video sender that is redundant. With a little cunning and the use of a soldering iron you can rebuild a video sender so it'll fit in a 54mm tube. All you actually need is the video pre-emphasis circuit and the transmitter itself in the metal can. If you don't feel like doing the surgery yourself you can buy a video transmitter from RS (stock number 382-0841) and all you'll need to do is add a switch to select the channel, a 5v voltage regulator and a small antenna.

You'll also need a camera small enough to go in your airframe. There are two classes of camera, cheap CMOS ones and more expensive CCD ones. CMOS ones cost typically £30-60 and usually have fixed lenses and shutter speeds. The CCD cameras cost quite a bit more, £100+, and tend to either have a changeable lens (or more of a range of choices at purchase) and can be adjusted for shutter speed, aperture etc. With a high speed vehicle a fast shutter speed is very useful, especially for frame grabbing from the recorded video, but this isn't absolutely essential.

The final thing you'll need in the vehicle is a power supply for the camera and transmitter. A lot of video transmitters and cameras work from a 12v supply and a typical set-up will need about 100-150mA of current. So if you stick with 12v you'll need to be using either Duracell MN21 batteries which will last 10-15 minutes or a pack built up from either AA or AAA cells which will run for probably more than 10 hours. This will be way more than you need, especially if you have a switch so you can turn the kit off while you wait for a go-ahead to launch.

Now if you take the top off a video sender and have a dig around you'll find that the power feeds into a 7808 or 7809 regulator so a fair proportion of the 12v you're feeding it with is just wasted as heat in the regulator. You should be able to snip this regulator out and feed 9v from a PP3 directly into the

metal can which is actually the transmitter. Similarly a lot of cameras specified to run on 12v will run perfectly well from a 9v cell with no loss of image quality. Finally, a good use for all those PP3s you wouldn't trust again with your altimeter to deploy your chutes properly.

On the receive end you'll need a better antenna than the patch supplied connected to the receiver. You're OK to remove this antenna, this end doesn't radiate any power so you can put as big an antenna on this as you can be bothered to wave around. So what's your choice in antennas? The patch on the transmitter will radiate circularly polarised signals so you want a receive antenna which matches this. One of the easiest to make is a helical and plans are freely available on the net for one which will cost less than a tenner to make and works reasonably well. See http://users.bigpond.net.au/jhecker/

Helical Antenna

How long should the helical be? The longer it is the more gain it will have so the better the range you'll get. The only problem with this is that as it gets longer it also gets more directional making it harder to track the vehicle in flight. Somewhere between 0.5 and 1m long would be a good compromise. Once you've got your antenna working connect it to the video receiver with the absolute minimum length of good coax cable and good quality connectors. If you can, mount the video receiver directly on the back of the plate of the helical.

You'll also need something to power the receiver, probably a 12v lead acid battery and some kit to record the signal onto tape with. A few people are lucky enough to have DV camcorders which you can feed external signals into. Those of us on tighter budgets end up using a domestic video and a portable telly running from either a generator or an inverter and a car battery. Ground support and how to power it is the real bugbear of doing video from rockets

Pointing The Camera

There is now a big question of what you want to see from your video camera. Do you mount it so it looks down the side of the vehicle at the ground or do you mount it looking straight out the side? My preference is for straight out the side because I'm more interested in using the imagery for remote sensing and photogrammetry. Pointing down the vehicle is great for getting ground dropping away, classic V2 film footage but once your chute is out your camera is looking at the sky.

If you were going to be really clever you could setup some way to switch between two cameras so you go over to looking straight out once the chute has deployed to give you the best of both worlds. You could arrange something with a moveable mirror but a microswitch bonded into the coupler of your separation joint could do this or you could use a magnetic apogee detector and a relay.

Another problem is axial spin. Every rocket will spin about its axis as it goes up because there's no way you'll get every fin on perfectly straight and aerodynamically matched. Granted, some will spin more than others and a few test flights with a little bit of fin-filing should slow the spin to a useable speed. My ADR-2 rocket spins slow enough to get decent video without tweaking but Ben Jarvis' motor section from Gone Fission causes a five-times-a-second spin which gives pretty useless video from the first few seconds of flight.

Tracking The Rocket

Don't stand too close! We've all had that neck-jerk feeling after the countdown so stand back a bit, now imagine trying to keep a 1m long antenna pointed directly at the rocket. It is way easier to track the vehicle and get good video if you stand 100-150 metres back from the launch point.

Holding the antenna at arms length is a good technique for tracking the rocket but I find my arm gets a bit tired after a while. I

tend to use more of a from-the-hip technique but this isn't really ideal either. Building a shoulder stock onto the back of the antenna/receiver with a bore-sight is probably the best way to go overall but I've not tried this yet.

So What Can I Expect?

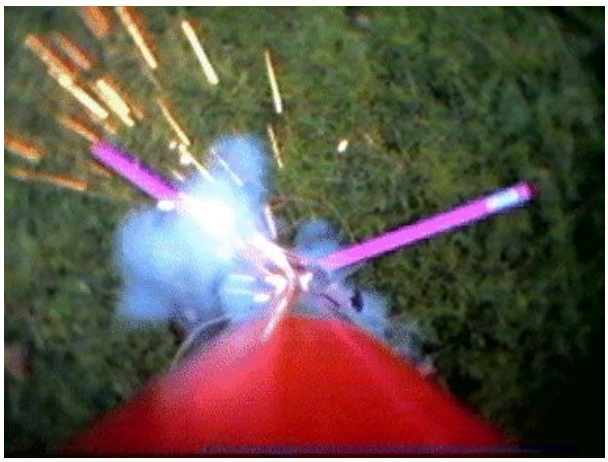
A standard video sender with a 1m helical antenna gives a theoretical range of of 2-3 miles. This is pure line-of-sight, no obstructions around either antenna and the vehicle tracked perfectly. With a bit of skill in tracking you should be able to get fairly good video with a few break-ups to between 3,000 and 5,000ft. It doesn't matter what you do, you'll always get some signal break-up as the vehicle tumbles under chute or spins on the way up. The only way to really get round this is to put a recorder in the vehicle. I can't afford to do this and I'm not sure I'd really want to risk that much money.

So what can you do to improve the system? You can't up the transmitted power. That's a big no-no. Your antenna is already built to trade off gain against directionality. So the easiest way to get more range is to get a better receiver. The video sender ones are _ok_ but they ain't the last word in sensitivity, no sirree! g1mfg.com sell a 13cm ENG (electronic news gathering) receiver for £55 which you can use with your video sender transmitter and will give you more than a doubling in range, possibly upto 150% more. Beyond this you'd be looking at using a s-band satellite LNB with a satellite receiver which is heading for mucho expense and a lot of trouble to track down.

Another possibility to getting better video is to have several ground stations and to combine the received signals from several recordings to give a good composite recording, picking the best image from each recording as you go. You'd need a decent PC with a video capture card and some software to do this but a lot of people already have this sort of thing and it isn't much beyond what you'll need if you want to put your recordings on the web for posterity.

Conclusion

A modest video sender transmitter/receiver will cost you around 40 quid if you shop around a bit (Maplin, Currys, Argos, RS etc.). A camera will cost another 40 quid (Maplin, RS, Farnell, Henry's Radio) and a helical antenna will set you back less than a tenner. Add in a few battery holders, some wire, switches, connectors etc. and you're looking at about 100 quid to get a system working. Not bad going, huh? Cheaper than most altimeters, cheaper than a good few PML kits.



Launch Pad - Rapier

by Darren J Longhorn

The Launch Pad make a wide range of scale mid-power model kits of missiles. They usually fly on one or more 24mm motors. They fly best on AP motors in the E - F range, but can usually be flown with moderate success on BP D power. I was attracted to this kit because it's a cool looking British prototype, and relatively cheap. The skill level is '4', but there is no indication as to what this means.

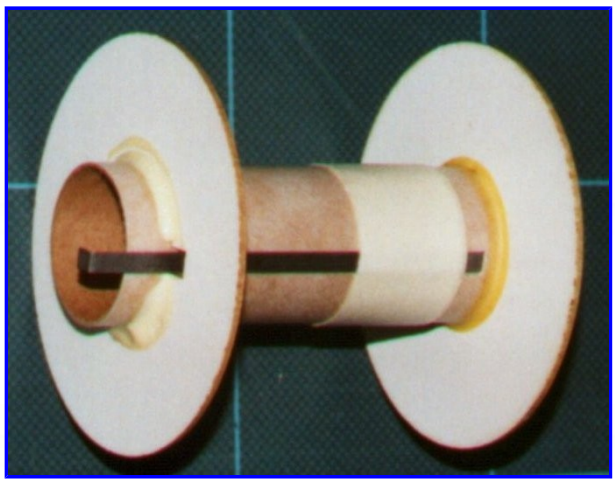
The kit contains the following parts:

- 24mm motor mount
- Motor clip
- 3 centering discs
- Plastic nose cone
- Nose weight
- 2 2.6" body tubes
- 2 couplers
- 2 3/32" balsa sheets
- 8 1/4" x 1/8" balsa strips
- 8 cocktail sticks
- Paper fin templates
- Paper arial covers
- Paper nose cone extension
- Paper shock cord mount
- 18" octagonal mylar chute
- 8 Shroud line anchors
- Shroud lines
- Slip swivel
- Barrel swivel

What you get is fairly similar to a large Estes kit. It compares well with the Estes Phoenix, though if you decide to use the nose cone extension, the Rapier requires more attention to finishing. The quality of instructions is perhaps, not quite as good as a similar sized Estes kit, but are still adequate. There are no decals, but additions such as the parachute swivels make up for this.

Straight from the bag

The motor mount and is very similar to an Estes mount, and goes together very easily. Two of the centering rings are glued over the motor mount. I used yellow wood glue throughout construction. This makes for joints stronger than the cardboard and balsa and I find it easier to use than white PVA.

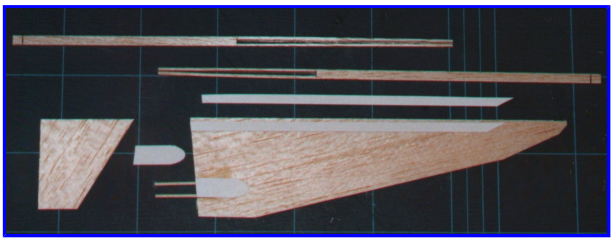


Motor Mount

The paper nose cone extensions which feature in many of Launch Pad kits are infamous and have started many a thread on rec.models.rockets. Some say they are easy to put together, others despise them. Personally, I'm not much bothered. The kit will still produce a flyable model with or without the extension. Although I did try to make the extension following the instructions carefully, I failed miserably. I replicated the template and tried again with no more success. The problem for me is to make a sharp tip. It's just too hard to form it without creasing the paper. I didn't give up though. I tried again using an alternative technique. Instead of using just the

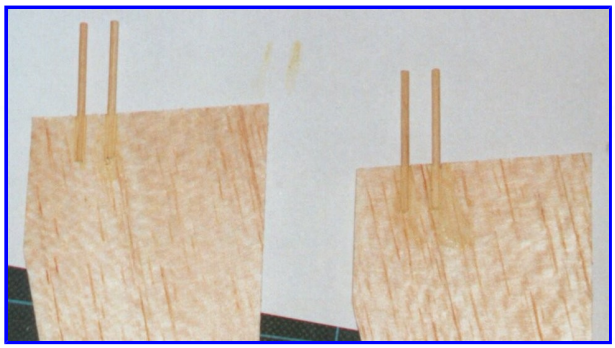
amount of paper needed to form the cone, I started with a much bigger sheet of paper. I found that this could be formed into a large cone, the tip of which matched the cone required. This could be done without ever touching the tip, meaning there was a good sharp tip, and no creases. I applied glue after forming and held it until it set. Once the glue had dried I cut the tip from the large cone. It took me a couple of attempts to get the angle right, but this was because on the first attempt I neglected to measure it! The finished cone was glued to the plastic nose. The instructions say to coat the paper extension with CA, but I decided I was goinf to coat the entire model in finishing epoxy, so I omitted this step. Insted I gave it a couple of coats of sanding sealer to add little strength and to stop it soaking in too much epoxy.

The body tubes are good quality. The two lengths are connected together with the coupler. The motor mount is glued approximately 2" inside the lower of the two body tubes. The remainig coupler is used to position the motor mount, and also to strengthen the end of the body tube. The third centering ring is glued 6" inside the top of the body such that it prevents the 'chute from slipping backwards at launch.



Fin parts

The fins must be cut from the balsa sheet provided. There are no markings on the balsa sheet, and templates for both sets of fins are provided. It would be easy for the novice to runout of balsa due to bad lay out. Two slots must be made in the four forward fins to mount the ariels. The ariels are simply made by triming the cocktail sticks to length. The balsa strips are for the fin mounts. These must be cut to length, and then 3/32" slots cut out to mount the fins. This isn't easy as the parallel cuts required are very close together. A good metal straight edge to control the knife is a must. I gave the fins two coats of sanding sealer with a light sand between coats.



Fin Antenna

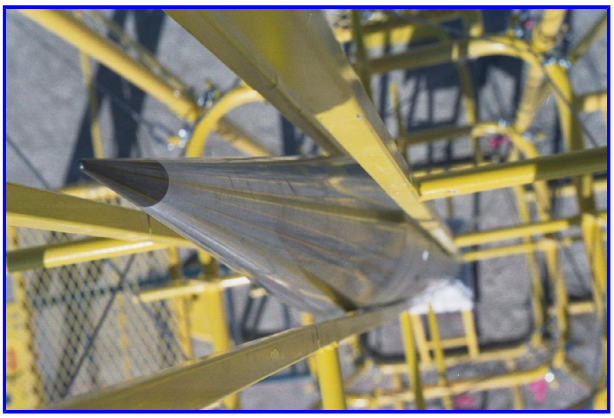
To finish the rocket I tried a new (for me)technique. I painted the entire surface with finishing epoxy (zpoxy brand). This is a little different to normal epoxy in that it's much runnier, and almost comletely odourless. It went on OK, apart from a couple of areas that seemd to suffer from the 'surface tension' effect you see when you dop water on a water proof surface. I've since discovered that this can be prevented by lightly sanding the areas before application. Once dry a light sand overall was all that was required before the primer could be applied. A single coat of primer and a single final coat were all that were required. The instructions are pretty vague when it comes to paint schemes, with just a single illustration and no decals. I searched the web and found schemes for the British Army (olive) and Saudi Army (sand), but instead went with overall orange that seemed to be indicated by the package illustration.

So far I've flown the Rapier three times, twice on a variety of RMS and single use E motors. All the flights were excellent, very straight and stable looking. None of the recoveries have resulted in any damage.

You can get the kits direct from LP in the US - www.the-launch-pad.com but it might be easier to order from Rockets & Things in the UK - www.rockets-things.co.uk.

SpaceShot 2000, *an attempt to reach space*

by Richard Osborne



The day before the start of the BALLS launch event that MARS was attending in the Black Rock Desert in Nevada, in October 2000, we were privileged to be able to witness what was hoped to be the first amateur rocket to launch into space.

The rocket was a single stage, solid propellant rocket built by Ky Michaelson and his Civilian Space Exploration Team. Ky Michaelson, known as "The Rocketman", is very well known, and very popular in the amateur rocketry community. He runs a company called Rocketman Enterprises, who produce the largest flying rocket kit in the world (the 19 foot tall, "Big Kahuna"), as well as a line of near bomb-proof parachutes and recovery systems.

The rocket, was a single stage rocket with an aluminium airframe. The solid rocket motor was built by Kosdon East. The avionics consisted of AED R-DAS flight computers, together with GPS modules and additional firing modules. The parachutes, were naturally, Rocketman parachutes.

When MARS arrived at the launch site, we were instantly struck by the sheer professionalism of Ky's launch operations. Everything was very well run, from the logistics through to the pre-launch weather balloons sent aloft to determine the wind strata at various altitudes, and hence to finalise the launch adjustments for downrange dispersion of the vehicle.

Ky Michaelson with the SpaceShot 2000 vehicle

Originally planned for an early evening launch, Ky decided to launch early the following morning to allow more time to ensure that everything was perfect. MARS parked the RV in the middle of the desert, along with a small group of U.S. rocketeers, and after sharing of beers and discussion of rocketry in general, staggered into our beds.

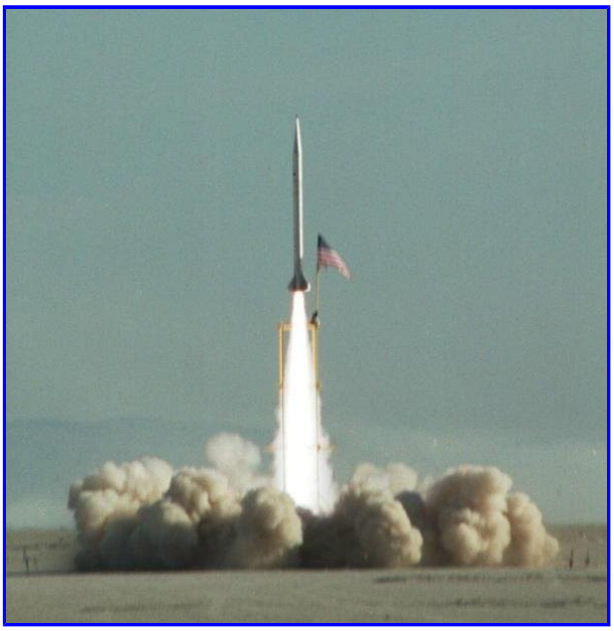
Launch Day

At 6:00am the following morning and the MARS team rolled out of sleeping bags to go and watch the launch. Ky and his team were already up and all ready for the early morning launch. Weather balloons were being inflated and released, and final preparations were well underway.

7:00am - the Sun started to rise above the Black Rock Desert, and the temperature rose from freezing cold to warm, very rapidly. Now support vehicles were pulling back from the rocket in anticipation of the launch.

Sunrise

8:00am - 10, 9, 8, 7, 6, 5, 4, 3, 2, 1... Ignition and lift-off.



Lift Off

From the observers position back where MARS were stood, the rocket had already climbed several hundred feet into the sky before the sound of the launch hit us. Hit us was the operative word. The roar as the R-class motor came up to full thrust was spectacular, and the vision of the R-class rocket blasting into the sky was definitely one to remember. The rocket followed a very straight trajectory, accelerating quickly. Because of the superb visibility in the Black Rock Desert, as well as the obvious smoke plume and flame, it was possible to track it visually very easily.

Then, at 39,000 feet, at motor burn-out, disaster struck! The rocket could be tracked on its straight trajectory very clearly, so as soon as the smoke plume made a very sudden 90 degree turn, and then started spiralling, it was clear that something had gone very wrong.

A hush fell on the assembled crowd, as everyone scanned the skies for possible falling pieces of rocket. It was several minutes before someone said that the rocket had impacted several miles downrange. Very quickly, Ky and his team were off to recover it.

Conclusions

The rocket was recovered in far better condition than one might expect for something that has fallen 39,000 feet out of the sky. It was badly dented, and the internal bays had been broken, but it still looked like a rocket.

The data recovered from the R-DAS indicated that the rocket had reached 39,000 feet, and a speed of Mach 5. It was at this point, that a fin tore off the rocket, causing it to go out of control, and to break up under aerodynamic forces.

All in all, even given the outcome, it was a tremendous event to watch, and MARS learnt an awful lot about how to conduct safe and professional launch operations for future space launches.

Given someone of Ky Michaelson's tenacity, we can guarantee that he will be back in the not too distant future (Editor's note Ky's Spaceshot 2001 was cancelled after the WTC disaster), with a new rocket, ready once more, to got for a launch to space. Given how well he did last time, we'd put good money on him succeeding next time.

All photos in this article are courtesy of Ky Michaelson.

Postcard from Kourou *(update)*

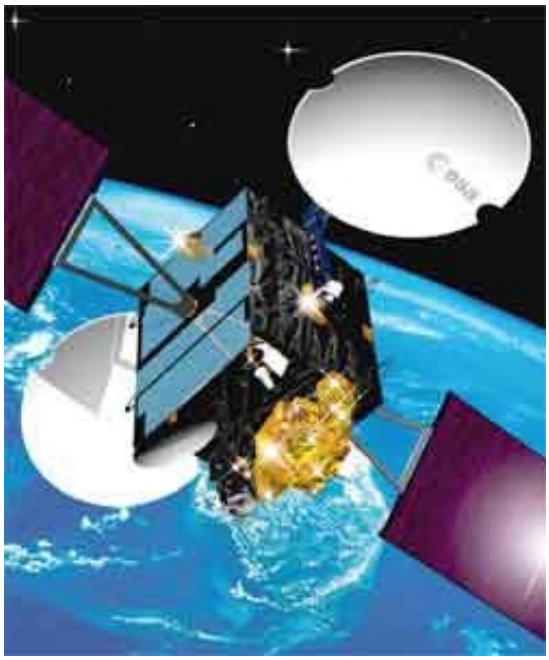
by Andy Moore

Recently you may have read my longish article about the time I spent at the Ariane launch site in Kourou. Part #2 was supposed to be in progress for this issue of 10..9..8... but as you may have heard, there was another Ariane 5 launch failure. Envisat was supposed to be launched in Mid October, but has now been delayed until at least January 2002.

ESA was launching Artemis (an experimental data relay & communications satellite) and BSat-2b (a communications satellite) on Ariane V142, but at the start of the burn of the final stage there were "irregular" burn characteristics. Arianespace have been under enormous pressure to determine the cause and come up with a fix, and it appears to be related to premature ignition in the injectors, rather than combustion chamber.

Storable Propellant Stage (EPS)

The fix has already been installed in the next Ariane 5 (V145), which is Envisat, and that Ariane 5 has recently been assembled, with the main cryogenic engine and solid rocket boosters installed in the last few weeks. The payload shroud is ready for Envisat, but the final storable propellant stage is still under test.



Artemis

As for the satellites, Artemis is in a bad orbit, but ESA believe they can spiral the satellite out to its correct orbit using the new ion-thrusters, but this will take around one year! B-Sat 2B has been lost. Atlantic Bird (a Eutelsat communications satellite) was due to be launched on an Ariane 5 immediately before Envisat, but has been moved to an Ariane 4, and was successfully launched at 8.21pm on September 25th.

BSat-2b

If or when Envisat is launched, watch this space for an update, and maybe even Postcard #2 from Kourou.

Cuts, burns, twisted ankles & *predators*

by Stuart Lodge

I really rated the piece by Mark Turner on "Field First Aid" : model rocketry-space modelling can turn round and bite in so many ways. We might start with opening the kit box or picking the staples from the Estes' kit bag, then there's sharp knives, savage adhesives, life-threatening paints and imflammable solvents. Wot's that about modroc motors being dangerous ?!?

Assuming we get to finish the bird and escape the mayhem on the highways, we're gonna fly the thing and chase after it - get some good trainers/trainer boots/hiking boots...they'll save many a sprain. But maybe the vital thing is Risk Assessment - working out what's worth doing to find a rocket and what isn't. Britain's best international space modeller is very poor at Risk Assessment, in recent times he's...

1992 Swam across an irrigation canal in Florida at the World Champs, near were an alligator had been seen 20 minutes previously, to retrieve a streamer duration model worth a fiver.

Same meeting, went far off the beaten track, miles from anywhere/anyone, to retrieve a parachute duration model worth a fiver and saw a log on the ground. The log moved and so did Loggi (Linford who ?!?).

1993 Fell into a deep covert on a field near Ljubljana, whilst looking into the sky at a parachute duration model worth a fiver.

1994 Padding round barefoot on Leszno airfield at the World Champs, saw the broken bottles/glasses just in time, whilst chasing a streamer duration model worth a fiver.

1995 Ljubljana Cup...the ground beneath me disappeared - and so did Loggi, stepping waist deep in stagnant water. Scale model was worth more this time.

1996 Relatively free from life-threatening incidents, though did become sick after eating the food at the hotel in Ljubljana and had to separate a Briton and an American at the banquet of the World Champs.

1997 Carl Neubronner Cup - Swam across a river in full flood, to retrieve a streamer duration model worth a fiver (but did come third..)

Survived a week in Turkey at the World Air Games, then drank water from a bowser... Scale Judge, Ian Dowsett, risked no water at all and nearly died (yes, really..).

1998 Could have drowned, or been struck by lightning at RAK98, Suceava or Ljubljana. Otherwise, nothing to report.

1999 RAK99 - waded across a fast running tributary of the River Aare and was swept over, in pursuit of a boost glider worth a fiver. Told there was a ford 100m upstream.

2000 Liptovsky Mikulas World Champs - climbed a high fence protecting a military area, chasing a boost glider worth a fiver. Looked silly trying to face down Slovak Army guard with AK47. Twisted ankle jumping down and taken to medical facility. Glider returned by Army, five minutes later.

2001 Sprayed with disinfectant on train at the Hungaro-Serbian border "..for the foot & mouth". Did well at the Sirmium Cup, but badly bitten & infected by insects.

Week later...Kuchyna Cup on Slovak Airforce base - climbed high wall attempting to retrieve streamer duration model worth a fiver, sprained ankle jumping down. Questioned later, after being seen photographing sexy strike aircraft on the base (nice snaps of Su-22 Fitters, Su-25 Frogfoots & MiG-21 Fishbeds, actually).

Train journey home from Vienna - drank Schnapps & Champagne for hours, with "old girls reunion" travelling back to northern Germany. Could have died.

...and that's not all! The above are all true - and I'm not proud of some of them...one day it might end in tears!

UKRA News

2001 A.G.M.

The date and location for the 2001 AGM has been decided. The location will be the same as last year, Cherry Willingham Community School, Croft Lane, Cherry Willingham, Lincoln, LN3 4JP. The time and date is 12.00am on 16th December.

Competition

This issue's competition is straightfowrard, simply answer the following questions: *What is the name and the purpose of the module most recently added to the International Space Station?* Send your entries either to the UKRA PO Box, or by email to competition@ukra.org.uk In the event of more than one correct entry, the winner will be drawn from a hat. The winner will receive a Quest Model Rocket Kit.

Competition Results

There was no competition last issue, as the previous competition was carried over. We now have a winner of that competition, but first the correct answers:

1. MRC Firefighter
2. Angela Waddington's Patrinot
3. Airborne Surveillance Missile
4. Brian Best holding Warlok
5. Mercury Redstone
6. Bullpup
7. Estes Moondog
8. Tintinique (Sob! - Ed)

Congratulations to Adrian Hurt who, with six correct answers, is the winner. A Quest kit is in the post to you Adrian.

Level III project: *V0.5*

by Roy Trzeciak-Hicks

The idea of building a Level 3 rocket first came up when Bob Arnot said it would be great to have the first UKRA level 3 flight to occur at the EARS launch site. This idea rattled around my head for a while. I had been planning on building a larger rocket between 6 to 10 Inches to Fly on clusters of composite motors but this would have to wait as my mind started to think of level 3. Now which rocket to build, I had certified Level 1 and 2 using kits but that was just too easy for level 3, I wanted something big, something exciting and something new to me so I opted to build a scale model as I had no scale models. I had always liked the look of the V2, it just says CLASSIC all over it. This is was where today's space travelling rockets had their birth, from the V2, so that was what I would build. Yes, the V2 was a weapon of war and many died because of it, both the English getting it fired at them and the Polish POWs who were forced to build them. I have a Polish background on my wife's side of the family and my mother was in London when a V2 fell in the next street. I have my anger for the Nazi's that used the V2 but the V2 is still a classic rocket and without its development man may not have ventured to the moon when they did back in '69. The V2 meant a lot to rocket history and this was why I chose it as the subject for my level 3 rocket.

I started to think about designing the rocket back in December 2000, I found scale diagrams along with a lot more information on the internet at www.v2rocket.com and immediately started to convert the diagrams to a scale that would be workable for a level 3 project. From these early design days I knew this would not be an easy project. I would be building an airframe larger than I had ever done before. The Rocket would have to be stronger than I had built before to take the massive kick from the M motor. The recovery would mean using a big parachute, maybe two.

I started to design the rocket on paper not using Rocksim at the start. I worked out the design of the rocket and came up with a design that broke the rocket into 3 main bits for ease of transportation. The three sections would each be based on a tube.

The Nose Cone would be made from a 10" tube, this would have blue styrofoam glued to the outside of it and shaped on a lathe to give the nose cone its shape, this was then covered in fibreglass. This tubular design meant that the parachute could be stowed in the nose to assist in keeping the weight forward. Also the nose cone would have a solid wooden tip to again give weight where it was required also to provide a strong tip as this would be the point of contact for the nose cone upon landing.

The main body would consist of a 16.25 inch glassed cardboard tube with internal plywood strips to add longitudinal strength. The Fin can and boat tail would be constructed as 2 parts then joined later.

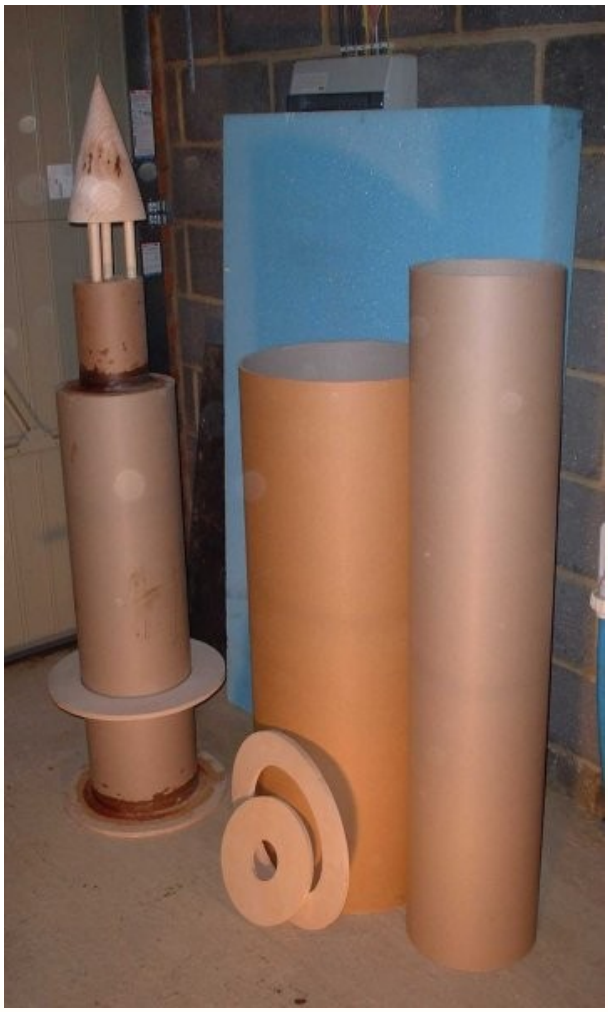
The Boat tail was constructed in the same manner as the nose cone, being based on a 10" cardboard tube covered in styrofoam then shaped on the lathe and given a coating of fibreglass.

The Fin can consisted of the fins with centring rings that locked them all together over the engine mount tube, The fins and centring rings were made of 1/2" 9 ply birch.

All component sizes were calculated and then the weight off all the components were calculated. This then let me over ride the weights that Rocksim would come up with to give me more accurate figures. The design was then put into rocksim, The whole rocket only had one part that was pulled from the database and this was the 3" PML tube used as the motor mount. All of the calculated /weighed massed were entered against the components, this is where my first and critical mistake occurred, I had calculated all component weights but as all 4 fins were the same I only calculated the value the once but Rocksim asks for the weight of the fin set i.e. all 4 fins. Well you can image what this meant later on!!!

The design being complete and a stable rocket that would fly on the 75mm M1315 all simmed in Rocksim 5, I was ready to submit my report to the UKRA S&T.

I documented the design making the document clearer with the aid of diagrams of components and construction methods, trying to cover the design and construction in as much detail as needed In January I sent the document along with a 1-1 cutaway plan of the components of the rocket to Pete and Chas. A week later Pete was back in touch with just a couple of recommendations to the design. I had offered to send Pete the Rocksim file of the rocket but unfortunately Pete had not upgraded to V5 so could not read my file.



Components, including assembled nose cone core

With the design being passed by S&T late in January, I immediately started work on the huge nose cone and tailcone. First was to produce the solid wooden tip to the nose

cone, this was easily done on the lathe, checking the profile was correct. When this item was finished it weighed a couple of Kg on its own! Next, having glued all of the sytrofoam to the 10" tubes with PVA glue (some glues melt styrofoam) I started to shape them on the Lathe. I found that holding a saw so the teeth dragged across the surface of the foam produced the fastest and neatest cut however it does cover the garage, drive, street and the neighbours with millions of tiny blue foam particles.

Nose cone on lathe

Part-shaped tail cone

The giant fins were cut out along with the centring rings that would hold them together. With the fin can assembled, the tail cone could be slotted to slip over the fincan. This proved to be difficult and I ended up with the father in law on one side trying to direct the saw blade as I cut from the other side. After an hour of sweating, it was done and it slipped perfectly onto the fin can. For the first time I would assemble the whole structure to get a true idea of size, as each individual component did not show this off to its true extent. Having assembled the tail cone and fin can, we slipped the body tube on top only to find we needed to move the rocket onto the drive to fit the nose cone on! We took the rocket to the drive then climbed the step ladder to put on the nose cone, God I had never imagined it to be this tall even seeing the 1:1 scale diagrams It never hit me as to how big this would be.

Tail and body

The rocket stayed like in this state for over a month as I was nervous about applying the fibreglass to the body tube, nose cone, fins and boat tail. I eventually picked up enough courage to go for it, I started on the simple body tube. I applied 4 layers of 100g/M Satin weave cloth, this went on nice and easy using a foam roller to squeeze out any trapped air. Next would be the fins, these were not solid wood they had large cut outs to save on the weight, these cuts outs were filled with blue styrofoam. The method of applying the glass would be different so as to reduce excess resin and ease application. The cloth is laid out on a sheet of melinex and resin is pored onto the cloth, a second layer of melinex is applied and a squeegee used to ensure the cloth is covered in epoxy and all air is removed. This method removed excess resin leaving just the right amount. The cloth / melinex sandwich can then be cut to shape and the melinex top sheet removed giving access to the wetted out cloth. The cloth

could then be applied to the fin, the same method was used to apply glass to the nose cone and boat tail

It was now that the mistake I made many months earlier came to light as I test fitted all components to check the C/G it was way to far back, all I could strip from the rear of the rocket was stripped but still the C/G was too far to the rear. The only way to make the rocket stable would be to add 14Kg of lead to the nose, however this meant that the 17ft parachute I had was no longer large enough, so I ordered a 28ft Man rated chute. It also meant that the M1315 would not lift the rocket the only thing to do was upgrade the 3" motor mount to a 4" one and use an M1939. A desperate search was started for a M98/10240 and the reload to go with it. The reload was obtained with relative ease, as some had just come into the country and one person had ordered two reloads but had no casing. Sso I purchased his reload from Pete D but the search for the casing proved difficult. I found 3 Casings in total only one new, the other two had been fired once. Most of the 98/10240 casings in the world had been purchased by StarChaser Industries so much of my search ended with no availability, but I managed to get a casing in time for the Big Ears event.

I prepped the motor the day before the launch to find the end closure would not close fully. It left about 3/16 of thread visible, a quick phone call to Mike Reiner revealed the trick to doing these up, as it was quite normal to get tight with this amount of thread protruding.

The next day at Big Ears the event I prepped the rocket after a morning of being RSO. The rocket was carried out to the away pad in its 3 sections and assembled at the pad, the obligatory photo shoot was held and then after what seemed an age of prepping we were ready to go for a launch. I almost forgot to arm the electronics if it were not for a reminder from Ben Jarvis on his way past as I was about to hook up the ignitors. Everything armed and connected, video cameras rolling we went for Launch. The countdown was relayed from the flight line to the crowd line by mobile phone. 5..4..3..2..1..LAUNCH. The motor lit first time and came up to pressure in an instant. Dense, white smoke started bellowing out of the bottom of the rocket as it started its journey. The lift off was slow and majestic showing off the full power of the motor at a crowd pleasing height. It is guessed to have gone to about 2700ft as it was simmed to do 3200ft. The crowd were cheering and shouting as the huge rocket powered for a full 6-second boot and then coasted the further 10 seconds to apogee. At apogee there was a lack of action and almost immediately I realised that something had gone very wrong. The rocket arced over and started to whistle on its way back in. The Rocket debris covered a large area with the fin section bouncing 40ft in the air to land 20ft away from the main impact crater. The tip of the nose cone was 3ft under the surface of the ground!

What went wrong? Well probably everyone has a theory as to this, but what is known for sure is that at least one of the ejection charges went off during impact, as the rocket started to break apart. As to if one charge went off at apogee it is still not sure, if it did then I should have stuck to the charge size calculated not the reduced charge. I had changed it because everyone was shocked at the initial size calculated (35g) however, ground tests worked with the reduced charge (17g). Lesson learnt here is to stick to calculated ejection charges.Next theory is that the shoulder joint got forced on more than before and stuck due to the thrust of take off. Lesson learnt is to ensure a perfect fitting shoulder by not using built up shoulders.If one charge at least failed, then why? Well, one theory is that because the altacc was mounted on the outside body tube it may have detected any roll of the rocket as acceleration and hence the accelerometer thought it was still accelerating and did not detect apogee. Lesson learnt, make sure your electronics are near the centre of your rocket. And being as all electronics were smashed ensure you fully protect them, my next level 3 project may well have an aluminium box to house the electronics.

Well I may have failed Level 3 but I had fun making and launching the rocket and I will be back with V2 Take 2. I already have a lot of the parts ordered I just have to make sure I don't make the same mistakes again!

Daddy, what is it for?

V0.5 roars into the air


HARIBO
Starmix
IRW 2001

IRW 2001 Launch reports

Looking up the valley

As for the IRW...

by Adrian Hurt

19/8/01: Turned up hoping to help with one of John's workshops. But I was a bit later than I'd hoped, and besides, the weather was lousy, no "pupils" had turned up, so there wasn't one. Being the first non-committee member to register, I got IRW badge 001. The computer tried to undercharge me, but being honest, I paid the full amount anyway.

20/8/01: Early in the morning, a reporter from BBC Scotland tried to do a live interview with John. Someone from Kelburn decided that this would be a good time to cut the grass. And so the interviewer started: "The sound you can hear is a tractor dragging a very large rocket booster to the launch pad at International Rocket Week. No, sorry, it's just an ordinary tractor." I had my own encounter with the press; a photographer wanted to get some pictures of rockets, and John and I had the only ones then present. He had me posing outside with a few of my rockets on a bench. Pete Davy and his father arrived and set up shop.

21/8/01: The marquee was successfully "docked" to the pavilion in the morning. (This was one reason why the grass had to be cut the previous day.) John was hoping to launch something for another press representative, but wind and rain prevented that.

Several other folks arrived, including the International component - Marcel from the Netherlands.

22/8/01: The press photographer was back. He wanted a line-up of a lot of my rockets. He picked up my Mini-ALARM, asking if it could stand up to be part of the line-up. I explained that it couldn't, partly because its fins would not support it and partly because it had a live engine. He put it back down *very* carefully!

Orion

My first launch was my Mini-ALARM, a scale-down of the Launch Pad kit. I also tried my Orion Shuttle again. An approximate scale model of a ship from the film "2001", this had flown well at UKRA2001, then crashed during

a flight at Clarecraft Discworld Event. This time it didn't fly well because only one of its two motors lit. But when it was reloaded and the launch control clips had been cleaned, it flew fine. Someone else had a problem with a Rogue Aerospace heat shield; it failed to protect the parachute, which had a hole burned in it. I had a different problem with my Rogue Space Needle. Its Estes D12-5 gave the most violent non-CATO ejection I've seen, blowing the thrust ring/shock cord mount clean out, and also blasting a hole in the heat shield. The parachute survived intact, though. Mike Crewe and Andy Moore had a drag race with LOC Stovis. Andy's, with the fins set differently, flew slightly better but ended up in a tree.

23/8/01: I made my first - and as it turned out, only - visit to the HPR site. The Land Rover could not get as far as hoped, so stuff had to be lugged by hand. The view was spectacular, as were the rockets. Chris Key's triple motor rocket went over the hills and far away. There were some certification flights, including one rocket (Rob Bevan's I think - Ed) with a body tube scratch-built like a model aircraft - fibre-glass wrapped round a frame. That one landed in a nearby field and scared some sheep. Dave Thompson had his camera rocket, and also an experimental rocket with active fins to control roll. The camera rocket worked as planned. The roll-control one didn't, and rolled, although it remained stable.

Unusual Construction

In the evening, Pete Davy "launched" one of his hot-air balloons, a long cord preventing its escape.

24/8/01: Mark Turner flew his delta-wing rocket glider. In theory, inertia should keep the elevators level until the boost phase finishes. In practise, on an A8-3 it did a loop and skimmed the ground. On a C6, it looped again but had enough height to make a good flight, although an attempt to seal up the ejection charge failed and it blew up the body tube. With the debris cleared and a D12 attached, it fell apart.

Martyn Clapham, the other Clarecraft Discworld rocket flier, turned up, went to the HPR site, and helped find Chris key's rocket. In the evening, Kelburn Country Centre put on a barbecue, somewhat more expensive than IRW's own, but welcome anyway.

25/8/01: Due to poor weather, the HPR flying was postponed. HPR would be flown on the reserve day, Sunday, but model rockets could still fly, so some competition flights were done. I sent up Titanic, which had previously done a charity flight on behalf of the Orangutan Foundation at the Clarecraft Discworld Event. In an exact replica of that flight, it went up on a D12-5 and two C6-5s in the main body plus two C6-0s in parallel boosters; one of the C6-5s failed to light, but the rocket went pretty well straight up anyway; then due to an inadequate recovery system, it damaged a fin on landing. It also carried a small flexiwing glider, the Millennium Falcon, so-called because it looked like a falcon and was built in the real year of the new millennium. That joke dropped like a lead balloon, and so did the glider because one of the wing spars had broken when Titanic's piston kicked it out.

The Vaughn Brothers Buzzard was a popular glider, probably because Pete Davy was selling them, and had been last year. Several made flights close to 1.5 minutes using C6-5s. Not entirely happy with the way the wings and fins on mine had turned out, I tried it with a B6-4 and got a time of over 1 minute, but never got to try again with a C6-5 because the glider disappeared into a tree.

I also entered the Lander contest; my Tri-F-O now had moving legs. But like other UFO types, it landed legs down as intended, then bounced.

Tri-F-O

Having done my RSO exam at UKRA2001, I got Pete Davy and Michael Williams to interview me, and duly became a model RSO.

26/8/01: There was supposed to be some model rocket contest flying before the aquajets, but almost everyone who wasn't working on aquajets was at the HPR site. I volunteered to do my first stint as RSO, but only got to supervise one flight, Martyn Clapham's lander. It flew successfully and landed correctly.

The aquajet contest was overshadowed by the news that Oskar Schwiglhofer had passed away. This didn't prevent many fine entries, and for once Paisley Rocketeers had some serious opposition, not least from Thrust. They still won the team contest as usual, though.

There were more pyro rocket contest flights, including my third glider attempt. At IRW2000, my Thunderbunny boost glider had thoroughly shredded. I brought the parts to IRW2001 and rebuilt it. Its first flight this year was on an A3-4T; it flew well, although part of its tail shredded when it clipped an ignition wire. Then I tried a C6-3, and it shredded again, this time losing a wing on the way up. But I have all the parts. Thunderbunny will return! (Is there a record for the model with the most shreds?)

The barbecue was a great success as usual, with plenty of food and drink for all. To round it off, a Saturn V was launched. Several Micro Maxx rockets were also launched from one of the benches.

27/8/01: My Orion Shuttle now had its Pan Am markings, but its first "commercial" flight was a disaster. It took off alright, then turned toward the trees, flew horizontally, and crashed hard. John Bonsor would prefer not to fly with my airlines!

Martyn Clapham's Wizzard's Hat, an Estes Big Daddy with a large paper nose extension and a veteran of IRW and Clarecraft flights, misbehaved too. It turned off at an angle and disappeared behind a hedge, but did in fact get its parachute out in time to prevent damage.

I had damaged my Mini-ALARM while trying to fit in a 1/2A3-4T. With the rear body repaired and braced by a piece of spent motor casing, it was a bit more tail-heavy than before, but passed a swing test and then made successful flights on a 1/2A3-4T and an A10-3T.

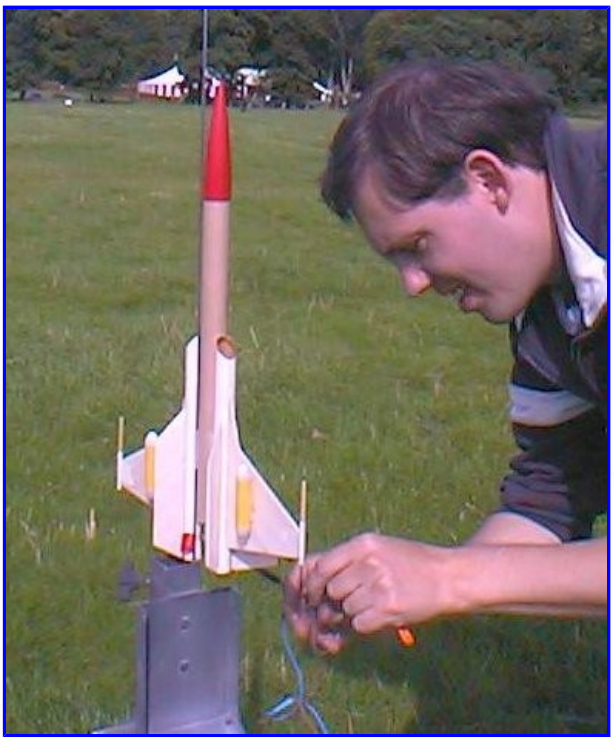
This was also the day of the beer cans. Several people had been working on rockets whose bodies were made from tin cans, either beer or other drinks. Other interesting flights were a Buzz Lightyear figure with two rocket motors, and a scratch-built model which deployed a squad of paratroopers. My own contribution to the general silliness was a UKRA flight registration form, properly filled in but turned into a rocket.

Launch Report

by Andy Moore (UKRA #1030)

Arrived on the Monday evening after a 15 hour journey from Holland to find Marcel, Pete Davy and the Perman's there already. After a good night's sleep in the B&B awoke to find that the weather had turned bad. Far too much wind, and rain to launch any rockets at all, so the day was used setting things up and catching up on old times.

From Wednesday onwards the weather was excellent, with blue skies, few clouds, and only a light breeze. Only one day would the weather disallow high power flights.



Andy's Interdictor

I flew a Rogue Interdictor in a drag-race with Darren Longhorn, and Loc Stovi in an F39-6T drag race with Mike Crewe's identically coloured Stovi. Unfortunately mine landed in the top of a tree, but thanks to Andy Issot for helping me retrieve most of it!

The first day of HPR flights saw my Pterodactyl launch on H123W and Matrix on H242T. The HPR site was at the top of the hill above Kelburn, which was quite a trek, but we all made it. The views across Cumbrae and Bute were definitely worth all the effort. One of the best flights of the week was Chris Key's on three I284W, which leapt of the pad. The rocket was seen drifting across the valley, and into the valley beyond. Fortunately, a search party managed to locate the rocket a few days later, even though the radio tracker had been lost during flight. Pete Waddington's VB Extreme 29mm minimum diameter "G" Altitude record attempt flew on a G80, with a G-Wiz altimeter and a radio tracker. Unfortunately tracking was lost, not helped by Chris Key's rocket on the same frequency! Pete's rocket was eventually found, but the ejection charge had failed, causing the rocket and G-Wiz to be smashed to pieces.

For the second day of HPR, only a handful of people turned out. I attempted to launch a PML X-Calibur, but only on a G64W for it's first flight. After 4 ignition failures it eventually flew, but only after using up a complete half-hour launch window! (Sorry guys!) The Pterodactyl Jr flew again, this time on an H242T, landing 50m away from the path back to the cars.

Saturday saw much of the competition flying as the low cloud prevented HPR. The Boost Glider contest was not the same as in previous years, with Richard Osborne and Kevin Cave not present. In fact on the Friday, all boost gliders stayed in one piece, and most actually did glide. The fact that most people had entered VB Buzzard kits may have been a factor!

In the evening Steve Gibbings and myself launched VB Extreme 29's on E15W in a drag race. Both shot of the pads so quickly, with mine attempting to home in on Arran. Mine drifted and landed in a horse field next to the golf course, with Steve's landing up-wind. Steve's was lost,

IRW 2001

by Dave Thomson

Tuesday 21st August 2001

Time again disappeared and the IRW was here. Each year we say that we must allow plenty of time to get ready and develop something new for the event. But every year we run out of time. Sean had managed to complete his larger upscale Estes Thunderhawk for UKRA2001 but did not fly it. I myself did not have much time to complete any new projects or repair the large Delta Clipper form last years event. This was mainly due to building my new garage, which is at issue of this report (Sept 2001) almost complete. I did however manage to complete a small stumpy rocket with an active roll control system and my first boost glider (Vaun Brothers Buzzard) that I hoped to enter into the competitions later in the week.

Andy Issott said he would meet us up there around Wednesday. Sean and myself planned to get up to Largs late Tuesday. Myself, my Dad, and my son made our way up to Largs with my Dad's caravan in tow late on Tuesday morning. We had a rather wet trip up but the forecast looked good from Wednesday onwards. We arrived at the Kelburn center late in the afternoon. The wind was very strong and delayed us putting up the awning until the Wednesday morning. We pitched the caravan and settled down for our evening meal followed by a sample of the local fire water (16 year old Lagavulin). My Dad checked the mobile for messages to find that Sean had called. It turns out that he was not able to make it that evening due to his company not letting him use his works van. In the end he had to arrange for a hire car for the next morning.

Wednesday 22nd August 2001

We arose to a beautiful morning with the sun shining and a very light breeze. Andy had arrived and was setting up his tent.

Wednesday was not a HPR day, so we began to prep some model stuff for later on in the afternoon. My son David would fly his Estes Tidal wave again. This RTF model has been flying at the IRW for 3 years now and had many good flights. A great intro kit for the younger ones. He would also fly his Naboo Star ship which was also a RTF Estes kit , both flying on C6 motors.

David with Naboo Starship

I began to get a 2inch scratch model ready that was to carry my new 2.4Ghz transmitter and camera payload. This rocket had flown many times before (it's first at the IRW in 1997) but was the first time with a significant payload. The main purpose of the flight was to try out the new transmitter and dipole antenna.

The transmitter, camera and battery were mounted onto a thin strip of aluminum that could be easily removed from the nose cone and loaded into the larger IRIS for a HPR flight on Thursday. Aluminum was used for strength to prevent movement of the components within the nose cone. In the end this may have been one of the factors why the range of the new transmitter was very much reduced from the original Response unit that I had been using before it's demise in Sean's Optima at UKRA2001.

My son's flight of his Tidal wave was perfect as usual. In fact it flew twice that night. Best flight was on a C6-5. A couple of modifications had been done to it from the standard kit, which were a much stronger shock cord and a streamer instead of a parachute.

The Naboo starship flight was interesting to say the least!! The rocket left the pad and immediately went unstable. It did a flat spin a few yards in front of us before hitting the deck and ejecting the parachute and setting fire to it. This will be going back to the shop. My concern is that other similar scale models from this range may do the same.

The camera down link was checked out for my flight. I did not have time at home to do any decent ground testing and with the HPR on Thursday it would be a case of emperical testing! The rocket was loaded with a G35-4W Econojet single use. The flight was good with some weather cocking but landed back in the field ok. The in flight recording was good but did show some breakup near apogee while it was rotating. The altitude was around 1000 feet.

Thursday 23rd August 2001

HPR launches from Les's farm at Birtlebog had been cancelled due to Foot and Mouth. HPR flights would be up the top of Ward Hill at the back the of Kelburn centre.We made our way up to base camp and we could see one of the landrovers further up the hill.

Carrying stuff from the Landrover

We persuaded Andy to come down to help us move some of the heavy stuff in the landrover.

My Dad went into the passenger's seat and had the 'ride of his life' up the side of the hill.!! "I am not going down in that" he said, "once is enough!".

View from Ward Hill

We knew the High Power site was a bit of a hike, but, Sean didn't realise it was nearly going to kill him. He got to the site and left his rockets up at the top. Then came back down to give me a lift with all the video equipment from the landrover. We began to get the rest of the stuff up. Andy looked knackered too! But as you can see from the pictures, the view was worth it..!!!

Sean had a great impressive flight from his Phoenix; lots of smoke, flame and noise. Problem though was a ripped chute on deployment and it sustained some slight damage on landing. He wanted to bin it despite being reassured by Andy and Myself that it was not as bad as it looked. Next flight for his upscale Thunderhawk on a G40-4W - excellent flight - it always breaks fins on landing due to design fault that he will conquer some day.

Andy launched his mini BBX on a H180W. Good flight but it was lost down the hill side for that day. It was found next day by me in the correct line but was nearer to pad than expected. Alt finally reported 2174 feet.

I launched my IRIS on a K550W. This had flown well at UKRA2001 recently. The sky today would hopefully give a better view of the flight. The camera and video were switched on and the rocket roared off the pad. The rocket did weather cock a little before deployment. The drogue ripped and the main had come out at apogee also, but the rocket was fine. You could hear and see the main deployment

charges go at 400 feet, minus the main chute! The IRIS came down only a few hundred yards away. No damage sustained, except the damaged drouge. I need to have the nose fixed tighter also!

Dave with IRIS

Another problem was that the video signal was lost at around 1000 feet and only came back in on way down. The new 2.4Ghz TX did not seem t give the same o/p as the old response unit. It could be the new Dipole antenna that I used with it, but I have my doubts. The Gwhizz reported 3200 feet. Lower than predicted, probably because of the weathercocking. I decided to get the strongest Sky Angle drogue I could lay my hands on from Pete!

I launched my roll control rocket that I had developed over the last week. It worked fine for a short while then lost reference and spun like hell!! I guess the rate movement on the rear fins was way too much.

Friday 24th August 2001

First thing was to get Andy's BBX from the day before. We spent a few hours looking up and down the hill until a lucky find by me spotted the BBX further up the hill than expected. All intact, no damage at all. We did some model flying including Andy Issott finally deciding to launch his Archer after bringing it many times to the IRW but I had never seen it fly. The Archer was flown on a G80T single use motor. Good flight and recovered well within the model field.

Sean had a drag race with his Estes Phoenix. Darren had the upper hand from the word go - well he did have an "F" compared to his "D"! Next he scrounged an E15-7 from Andy and put in his veteran Shadow - 7 second delay - he got more that he bargained for ….. low altitude deployment it wasn't - very low it was!! Luckily, he got away with no damage! PHEW!!

Saturday 25th August 2001

Flew my newly completed Vaughn Brothers Buzzard boost glider on a C6-3. Up until then the longest duration for other entrants flights were around 30 seconds. I was amazed at how straight the boost was and how high considering the amount of drag that the glider appeared to have. The glider separated at ejection but was too tail heavy causing it to do short loops. The airspeed must exaggerate any out of trim. The flight was 1 minute 20 seconds. It looked like I was going to walk away with it, but I made the mistake of telling Pete and Angela Waddington that I was using a C6-3. Their next flight was on a C6-5. That flight was great. The glider was well trimmed also. Total flight time was 1 minute 37 seconds! OK, right, I see, so…….I will put in a C6-5 also! But nope, it only added a few extra seconds to the flight. That was after trimming it a little more. But still not enough. The main cause of the discrepancies between the flights was the weight of mine compared to Angela's. I had painted mine, but that was a mistake. You could easily tell

the difference in weight, even though I did not use much spray paint. Well done Angela and the NSRG team!!

Largs 2001

by Pete Waddington

I think this was our fifth visit to this great event. We were looking forward to meeting the regulars and the new faces and flying many new rockets. As usual, a great deal of construction work is carried out through the week. We arrived on Wednesday and just to ease ourselves into the spirit of things, made only one flight - the TMRK NASA Scout. As suggested by the manufacturers, the first flight was carried out on a B4-4. This did prove to be a little underpowered, but successful deployment and recovery gained me my level 1 model certification.

Thursday Two more firsts for us here - the flight of Angela's "Four Lights" using CPR - a low power H motor was used and "Four Lights" put in a textbook flight, landing not far from the car, where it stayed until we collected it at the end of the day. I was attempting a G altitude record with a VB 29 Extreme. The G80-10 kicked the minimum diameter bird off the pad for a blinding, out of sight, launch. The VB was equipped with a G Wiz recording data and a transmitter borrowed from Andy Issott to assist with location. Then we lost it... Andy actually found the VB 2 days later whilst looking for another rocket. Not good news though. The motor ejection charge had failed and the rocket had come in ballistic.

Friday saw us back on the model field, with a successful launch of my first gap stage model, an ASP WAC Corporal - D12-0 to A8-3 just to play it safe on its maiden flight. Angela played safe, flying two of her favourite rockets - the Estes Big Daddy and her first ever high power rocket, the PML Callisto.

Saturday's My Apogee Darkbird, built through the week and entered in the Boost Glider competition, completely failed to glide! On the other hand, Angela, who had built a Vaughn Brothers Buzzard, won the competition with a flight of 1 minute 34 seconds. Even pipping "Top Rocketeer" Dave Thomson to first place. Experimental vehicles also got a chance today, and I was lucky enough to get 2 successful flights of my Monocopters.

Angela's Buzzard

Sunday was a mixed day. The brave souls who enjoyed mountaineering set off for Ward Hill for another round of HPR. Those of us who were of fainter heart lobbed a few models and mid power birds down at Kelburn. After the Barbecue in teh evening, a moment of madness gripped me. It was a beautiful still evening, a full moon was on its way, and, having asked permission, I decided to launch my Saturn V from the front area. This Saturn V is the Estes re-issue and was one of those on-off build projects that seems to take forever. As the sun went down, Angela hit the button and ignited an E18-4W reload, which propelled the Saturn V straight off the rail and into the dusk. At apogee, all three parachutes deployed, 2 x 24 inch for recovery of the main body, and one 18 inch for the capsule. It was only later, after having received many compliments on the flight, I had this awful thought - its a well known fact that scale models are not the best flyers - what would've happened if, after leaving the pad, my pride and joy did a couple of loops and headed straight for terra firma in front of all the attendees?!? However, my fears were unfounded.

The Soviet Manned Lunar Program

(Part 2)
edited & compiled by Marcus Lindroos

Mikhail Yangel's OKB-5 design bureau in Ukraine proposed a project called the R-56. It would have used a cluster of at least four long, pencil-like first stages & second stages to create a heavy-lift lunar booster. It would have used the same Glushko-produced engines as Chelomei's proposal, including the giant 7000kN thrust RD-270 which was as powerful as the American F-1 engine used on the Saturn V first stage. Little is known of Yangel's proposal, but it does not appear to have been a serious contender despite being a paper study since April 1962 -originally as a manned circumlunar flight (Harvey, 1996).

Finally, on Christmas Day in 1964, OKB-1 proposed a vehicle based on the N1 launch vehicle -its maximum payload weight now uprated to 92t from 75t- plus two modified Soyuz spacecraft. Korolev's deputy Vasili Mishin suggested that the Soviets use the same 'lunar orbit rendezvous' (LOR) technique as the Americans (Feoktistov, 1994). To save weight, the heavy Soyuz mothercraft (carrying fuel, parachutes and a heatshield for the return to Earth) would be left in lunar orbit while a small 1-man lander would descend to the lunar surface. The total weight of their L3 spacecraft complex would be only two-thirds of the LK-700's. But other OKB-1 engineers were not convinced, noting that the L3 already was dangerously close to the N1's maximum capability. One of the engineers described the program as being 'on the edge of science fiction'. 26 engines had to be installed on the first stage, causing serious reliability problems. Despite this, Korolev turned down a proposal to build a test stand for the N1 - a decision that would later come back to haunt the Soviets. Korolev, now suffering from serious health problems such as hearing loss and a heart condition, gradually became more isolated from his former allies (Hendrickx,1996).

The Soviet Lunar Program Takes Shape

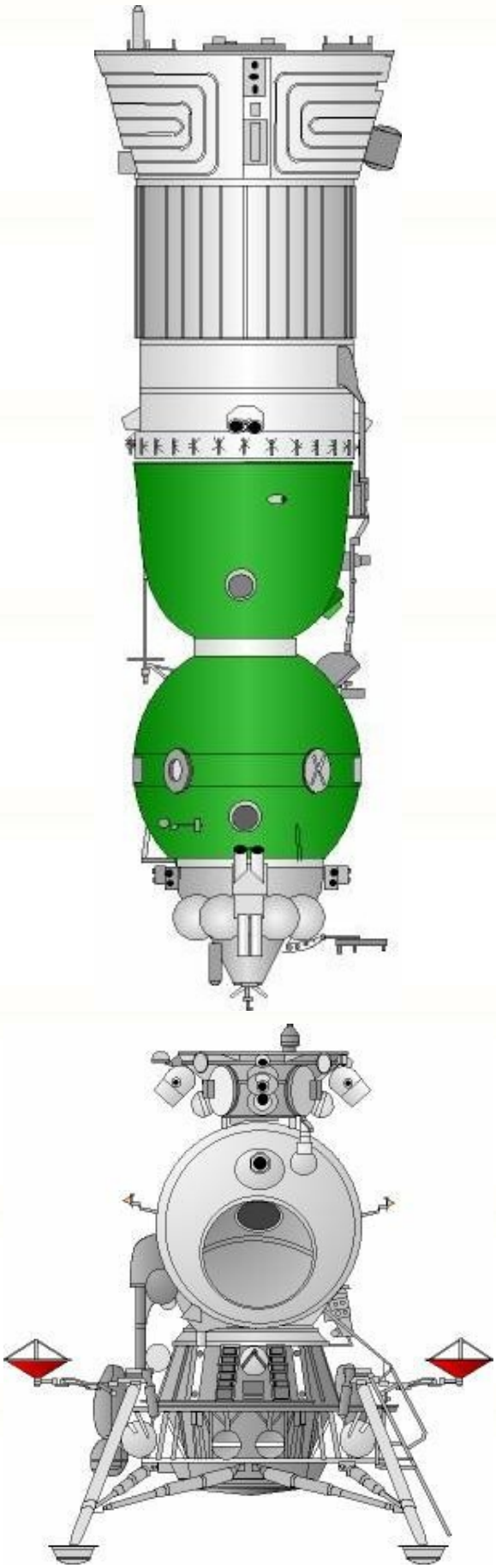
The Soviet Union continued to stay ahead of the US in the space race when, on 18 March 1965, Alexei Leonov became the first man to venture outside his Voskhod 2 cabin and perform a 'spacewalk'. Leonov's spacesuit was a prototype for the eventual 'moonsuit' and took place many months before the Americans were ready to attempt a similar mission. But the mission was fraught with danger and Voskhod was to be the last Soviet manned flight for almost two years.

Meanwhile, the Soviet Union had finally made preliminary decisions how it would send men to the Moon:

a) Manned Lunar Landing Program

Korolev's/Mishin's proposal was recommended by the Soviet Academy of Sciences, but Mikhail Yangel's design bureau would design the propulsion systems of the L3 craft. The other main contender, the UR-700/LK-700 project, did not receive funding. In May 1965, the Soviet government created the Ministry of General Machine Building to oversee the nation's space program. The goal was now a first manned landing in 1968, and 22 new cosmonauts were recruited in October 1965 to fly the Soyuz and L3 spacecraft (Harvey, 1996).

The L3 mission plan called for the development of two spacecraft that would form the L3 Complex. A lunar orbiting spacecraft named LOK (Lunniy Orbitalniy Korabl) would serve as the mothership during the trip to lunar orbit. One cosmonaut



LOK (top left), LK (bottom left)

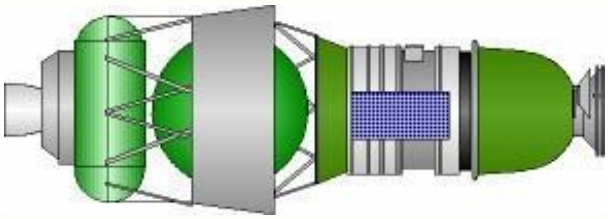
would then perform a spacewalk and transfer to a small LK "lunar cabin" (Lunniy Kabina) which would descend to the lunar surface. It would also be used to return the moonwalking cosmonaut to his waiting comrade aboard LOK in lunar orbit. Having docked, the LK pilot would transfer to LOK, the empty LK would be jettisoned and the two cosmonauts fire the LOK's engine to accelerate out of lunar orbit, returning to Earth three days later. In order to increase safety it was decided early on to launch an unmanned N1/L3 precursor mission to the proposed site of the first manned landing, leaving a backup LK on the lunar surface in case the moonwalking cosmonaut's own vehicle suffered damage during landing. The first Soviet moon landing would thus consist of two launches - one unmanned precursor flight and one manned mission to the same site (Hendrickx,1995).

b) Manned Circumlunar Program

Here the picture is less clear. Chelomei only began construction of the LK-1 in early 1965 (Pesavento,1994) and it appears as if there were technical problems attributed to OKB-52's lack of experience with manned spacecraft (Johnson, 1994). The Chelomei bureau fell from favor after Khrushchev was removed from power (Logsdon, 1994), and its contract for the circumlunar spacecraft was cancelled sometime in 1965 (Lebedev,1993), despite reports that ten LK-1 capsules were under construction by September of that year (Pesavento,1994). Korolev's opposition to the LK-1 apparently played a crucial part when the Soviet leaders decided to suspend the project in August 1965 (apparently against the recommendations of several subcommittees). Work on the LK-1 was finally terminated on 27 April 1966 and none of the scheduled 12 unmanned and 10 manned flights ever took place. The Proton ICBM was also cancelled and the UR-500K launcher version almost suffered the same fate (Hendrickx,1997).

Korolev argued that the circumlunar spacecraft should test the same systems and launchers as the primary lunar-landing program, to save time and money. The

Soyuz could be adapted for this, and Korolev's proposal to replace the LK-1 was accepted. Chelomei's UR-500K was however retained because Korolev's alternative proposal for a medium capability circumlunar booster ("N2" -- a scaled down version of the N1 without the large first stage) would not be ready in time to support a 1967 circumlunar flight (Hendrickx,1997). It appears that Korolev and Chelomei were ordered to design a new circumlunar mission in late 1965, and that the two chief designers agreed on the basic configuration of the new L1 project in September 1965. The plan would use the Chelomei's UR-500K booster, supplemented by a Korolev upper stage (Block-D) being developed for the N1 rocket and a stripped-down version of the Soyuz spacecraft (7K-L1). Korolev did not manage to wrest away control of the circumlunar project until 25 December 1965 (Logsdon,1994).



7K-L1 Block-D

c) Unmanned Spaceprobes to the Moon

The existing Luna E-6 soft-landing probes had encountered serious development problems and Korolev had to intervene personally to save the project from cancellation when Luna 8 became the eight straight failure of the series on 3 December 1965. Luna 8 was the first lunar probe constructed in the workshops of the Babakin OKB, which had been formed in 1965 to manage the robotic lunar program when Korolev was too busy overseeing it (Hendrickx,1996).

In May 1965 Babakin was also ordered to develop a new generation of heavy spaceprobes called Ye-8 utilizing the UR-500K Proton/Block-D booster. Like the L1, the Ye-8s were originally to be launched on the scaled down N1 rocket described previously, but this plan was cancelled in late 1965 when it became clear that the new N2 would not be ready in time (Hendrickx,1997). The main payload was a remote-controlled lunar rover that would be used to reconnoitre the landing sites of both the backup and prime lunar landers one month before the manned L3 craft was launched. The rover would also carry landing beacons to guide the LK craft during landing. As if that was not enough, the Ye-8 rover was also to be outfitted with oxygen tanks and a small platform for the cosmonaut, transporting him from his own (damaged-) LK lander to the backup craft if necessary!

Finally a simplified version called Ye-8LS would be created by removing the landing gear and wheels from the Ye-8 descent module/rover vehicle. It would orbit the Moon and photograph the candidate landing sites before the Ye-8s or LKs arrived on the scene (Hendrickx,1995). Before this, a modified version of the older E-6 probe would be outfitted with cameras and perform similar activities from lunar orbit in 1966-68.

Korolev Dies

Just as the Soviet effort was picking up speed, disaster struck. On 14 January 1966 Korolev died unexpectedly during surgery, robbing the Soviet space program of its main driving force. Korolev was succeeded by Vasili Mishin, who had worked alongside him since 1945. But Mishin was not confirmed in his position until May 1967. An able designer, he had neither Korolev's ability to lead nor his political standing. Continuing struggles with various government ministeries and rival design bureaus slowed progress. Chelomei and Glushko continued to push the UR-700/LK-700 project, formally proposing it again on 16 November 1966 when a 'Commission of Experts' led by Mstislav Keldysh reviewed the progress of the lunar program (Harvey,1996). But the L3 was approved, although its N1 rocket again had proved insufficiently powerful, so more time was lost

in yet another redesign which increased its payload mass to 98 tonnes. Four more 1st stage engines were added, increasing the total to 30.

The Soviets still managed to score two more impressive 'firsts' before the American moon program finally moved ahead in 1967. Two weeks after Korolev's death, Luna 9 finally became the first spacecraft to manage a soft landing on the Moon. Eight pictures were transmitted back before the batteries became exhausted on 6 February. Once again, America's equivalent project called Surveyor had managed to get itself two years behind schedule.

Two months later, Luna 10 became the first artificial lunar satellite when it swung around the Moon on 2 April. The probe (a modified E-6 with an added Kosmos particle fields satellite) was really a stopgap solution to prevent the far more advanced American Lunar Orbiter from getting there first. It carried no cameras but did broadcast the 'Internationale' to cheering Communist Party delegates in Moscow, who had assembled for the first congress under Brezhnev's leadership.

Slowly but surely, the Americans were catching up. Despite increased opposition in Congress and the Vietnam War, NASA spent a record $2,967 million on the Apollo project in 1966 - far more than the Soviets could afford to. The giant Saturn V rocket, its multibillion launch facilities and supporting infrastructure were ready for ground-based tests in May 1966. The Surveyor and Lunar Orbiter probes may have been second to the Moon, but they were far more advanced than the Soviet Lunas and quickly completed ten successful missions to the Moon in fifteen months. In manned spaceflight, the Gemini spacecraft (a two-man precursor to Apollo) had been a splendid success. Gemini 8 achieved the crucial first space docking in March 1966. The last for Geminis were put up only two months apart, practising long duration spaceflight, dockings and spacewalks.

The Soviets had to scramble to keep pace. A third two-week Voskhod flight was delayed for two months, then cancelled in within weeks of its planned liftoff in May 1966. The rest of the program was cancelled to save time and prepare for the first flight of new the Soyuz spacecraft (Harvey,1996). It also appears as if the giant OS-1 military space station - suspended since Khrushchev's fall from power two years earlier - was terminated the same year (Vick,1994), to be replaced by a much smaller Proton-launched version called Almaz. Chelomei was now in charge of the project and the LK-1 capsules would form part of the new space station instead, but he continued to propose his alternative Moon plans. In 1967 he began work on engineering mock-ups of the UR-700 engine bays and interstage areas (Vick,1996), challenging Mishin's authority as the leader of the lunar program.

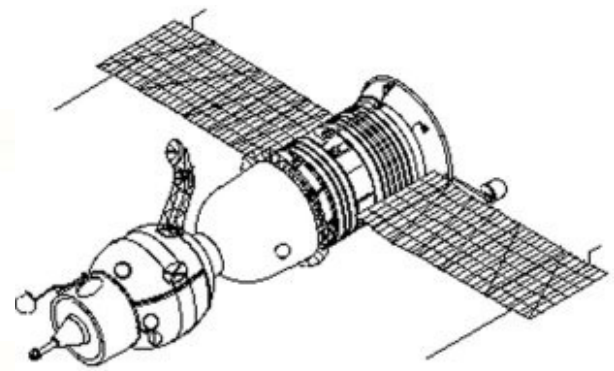
Early Almaz with return capsule

Disaster Strikes

The crucial centrepiece of the Soviet space program was now clearly the Soyuz spacecraft. Like its American Apollo counterpart, it was far more advanced than anything attempted before. It could change orbits and dock with other spacecraft. It could fly missions lasting several weeks, and variants of it would be used to fly around the Moon (the L1) and to be the mother craft for the manned lunar lander (LOK). The basic Soyuz would be launched on the old R7 rocket and practise rendezvous techniques in Earth orbit. Like Apollo, it suffered serious development problems and was behind schedule. The first three unmanned test missions all failed in November 1966-February 1967. But the Soviets could not afford to wait. Leonid Brezhnev demanded a first flight in April involving Soyuz 1 and 2, to

test the new lunar spacesuits during a 'spacewalk' as well as perform the first-ever docking between two Soviet spacecraft. Both feats would be absolutely essential for the L3 program as well.

Soyuz 1, with Voskhod veteran cosmonaut Vladimir Komarov on board, blasted off on 15 April. An atmosphere of pessimism prevailed at the cosmodrome since a record 203 faults in Soyuz had been detected during the final tests. The Soyuz 1 flight was plagued by serious problems too, and Komarov was commanded back after just one day, and the launch of Soyuz 2 (carrying three more cosmonauts) was quickly cancelled. Komarov's spacecraft (tumbling wildly after one solar panel failed to deploy) miraculously survived the atmospheric re-entry but then the landing parachutes failed to deploy and the capsule impacted at 600km/h. Komarov was buried in the Kremlin wall two days later. The accident set the Soyuz program back two years (Harvey,1996).



Soyuz 1

The L1 Program Begins

Meanwhile the L1 circumlunar version of Soyuz was also ready for flight, a full-scale version of the four-stage UR-500K rocket and spacecraft had been tested on the pad at Baikonur Cosmodrome in January 1967. The chief designer of the L1 spacecraft was Yuri Semyonov -currently the General Director of OKB-1/NPO Energia (Pirard,1993). In December 1966 the official schedule called for four unmanned tests in early 1967 followed by the first manned circumlunar flight in June 1967 (Hendrickx,1995). At least fifteen L1s had been constructed but only two of them were designed to carry humans, the rest carrying various experiments and biological samples to lunar distance. This suggests that the few planned manned missions were mostly for propaganda purposes. The main internal goal was to serve as a technology testbed, testing hardware (communications, navigation, descent systems etc.) that would be required later on, to land men on the Moon.

The UR-500 Proton had flown only four times before as a two stage booster -essentially the original ICBM configuration- and there were doubts about its reliability, so the Soviets planned to launch the L1 unmanned and send up its two-man crew on a Soyuz spacecraft instead. Both spacecraft would have docked in Earth orbit, and the crew would have spacewalked to the L1. The Soyuz would return to Earth unmanned while the L1 blasted toward the Moon. After two partly successful unmanned L1 launches in March and April the Soviets decided to abandon this plan, however (Hendrickx,1995).

The Soyuz accident appears to have delayed the L1 program as well and tests did not resume until September and November 1967. Neither spacecraft reached orbit due to problems with the UR-500K booster, however, and the original goal of a manned circumlunar flight to comemorate the 50th anniversary of the Bolshevik Revolution had to be abandoned. The best they could manage was an unmanned repeat of the aborted Soyuz 1/2 mission on 27 October, when ground controllers guided the Soyuz test vehicles Cosmos 186 and Cosmos 188 to a perfect docking (another unmanned Soyuz docking test was performed in April 1968). The Soviets pressed ahead and devoted most of their attention to the L1 project in 1967 and 1968, knowing full well that the Americans probably would achieve the first lunar landing. But a manned circumlunar flight before the Americans would steal at least some of Apollo's thunder (Harvey,1996).

Rocketry Groups and Contacts

Perhaps the most common question asked by relative newcomers to rocketry is "Where is my nearest club?". Here is a list of all rocketry clubs known to UKRA, both UKRA affiliated and others. Also there is a list of regional UKRA contacts who are happy to be contacted with questions.

If you would like to be listed here, or have your details modified, please let us know.

Groups

AspireSpace

AspireSpace run the NRC (National Rocketry Challenge) a national competition for University teams.

Web site: www.aspirespace.org.uk

BSMA

The British Space Modelling Alliance is the BMFA specialist body for space modelling.

Contact: Stuart Lodge
Email: loggi.interspace@lodge28.freeserve.co.uk

Black Knights

Black Knights are based in the West Midlands. They fly model and HPR rockets and have regular flying events.

Email: blackknights@cs.com
Web site: ourworld.compuserve.co.uk/blackknights/

CROCK

Crock hold regular flying events. Details of events can be found on the Rockets & Things web site.

Contact: Tony Betts
Email: y2ksoftware@btinternet.com
Web site: http://www.rockets-things.co.uk/

DSC

The Discovery Space Club are primarily a "space watch" group though they do carry out occasional model rocket flying activities, sometimes in association with STAAR.

Contact: Robert Law
Tel: 01505 815100

EARS

The East Anglian Rocketry Society have a flying site near Cambridge, and regular flying event. See their website for details.

Contact: Steve Randall
Address: 47 Western Ave. Felixstowe, Suffolk, IP11 9SL
Tel: 01394 274579
Email: steve@btinternet.com
Web site: www.spackington.com/

HART

Hornchurch Airfield Rocket Team hold regular flying events. See their website for details.

Contact: Peter Barrett
Address: 22 Grey Towers Gardens, Hornchurch, Essex, RM11 1JH
Tel: 01708 458463 or 07866 314371 (mobile)
Email: pete@hartrockets.co.uk
Web site: www.hartrockets.co.uk/

MARS

Over it's 10 year history, MARS Advanced Rocketry Society has grown into a national group of rocketeers committed to pushing the limits of non-professional rocketry, developing new rocketry technologies, breaking reocrds and above all having fun!

Contact: Ben Jarvis
Email: info@mars.org.uk
Web site: www.mars.org.uk

North West Rockets

North West Rockets are a small, informal group of rocketry nuts who do it for fun! We are not out to break any records, but do like to make rockets and fly 'em.

Contact: Dave Thompson
Email: DATSCOPE@aol.com
Web site: www.angelfire.com/on/DATSCOPE/nwr.html

NSRG

The North Star Rocketry Group are based in West Yorkshire. They hold model rocket launches locally, and attend HPR launches around the UK.

Contact: Darren J Longhorn
Email: info@northstarrocketry.org.uk
Web site: www.northstarrocketry.org.uk

PRS

The Paisley Rocketeers' Society, founded in 1936, are the oldest continuously operating rocketry group in the world. Involved in almost every aspect of rocketry. Since 1965 the PRS has concentrated on the develpment of aquajet rocketry.

Contact: John D Stewart, PRS Honorary Secretary
Address: 15 Bushes Avenue, Paisley, PA2 6JR, Scotland, UK
Tel: 0141 8842008

SARA

Scottish Aeronautics and Rocketry Association. Based in the West of Scotland.

Contact: Paul Timoney
Email: sarauk@rocket-science.co.uk
Web site: www.sarauk.btinternet.co.uk

SERFS

Southern England Rocket Fliers.

Web site: www.serfs.co.uk

SRA

Sheffield Rocketry Association.

Contact: Hugh Gemmell
Email: hugh@cruiserd.demon.co.uk
Web site: www.cruiserd.demon.co.uk

STAAR Research

Space Technology Applications, Astronomy and Rocket Research have three main activities:

- Public and educational rocketry workshops.
- Scale flight research, particlularly the Waverider aerospaceplane concept.
- Organisation and development of the annual International Rocket Week flying event, one of the main national events of the UK rocket flying calender. See website for details.

Contact: John Bonsor
Address: 15 Smith Avenue, Longbar, Glengarnock, Ayrshire, KA14 3BN, Scotland, UK
Tel:
Email: c/o Bobby Wark bob@scotroc.force9.co.uk
Web site: www.gbnet.net/orgs/staar/

Thrust

Contact: Mike Williams
Tel: Tel:01283 533848
Email: 100306.20@compuserve.com
Web site: ourworld.compuserve.com/homepages/thrust_for_space/

UKRA

United Kingdom Rocketry Association.
See page 2 for contact details.

WLRS

West Lancs Rocketry Society are based in the design and technology dept. in Edge Hill College in Ormskirk. We hold meetings roughly once a month although it really depends upon the weather.

Contact: Rob O'Brien
Email: club@wlrs.org.uk
Web site: www.wlrs.org.uk

WRS

Wirral Rocketry Society have launch sites in the Wirral and fly mainly A - D power Model Rockets.

Contact: Martin Sweeney
Tel: 0151 335 5415
Email: WRS@i12.com
Web site: www.WRS.i12.com/

UKRA Regional Rocketry Contacts

The following people have offered their contact details to UKRA in order to provide a more local point of contact for any rocketry related questions you may have. Feel free to contact them for advice about rocketry in their regions.

Ayrshire

Contact: Bobby Wark
Email: bob@scotroc.force9.co.uk

Cambridgeshire

Contact: Bob Arnott
Email: bob@fatboab.org

Lincolnshire

Contact: Charles Simpson
Email: chas@helix.ukf.net

London

Contact: Ben Jarvis
Email: rocketandroll@hotmail.com

Merseyside

Contact: Dave Thompson
Email: DATSCOPE@aol.com

South Yorkshire

Contact: Hugh Gemmell
Email: hugh@cruiserd.demon.co.uk

Staffordshire

Contact: Mike Williams
Email: lawn_dart@yahoo.com

Sussex

Contact: Rick Newlands
Email: rnewlands@aol.com

West Yorkshire

Contact: Darren J longhorn
Email: darrenlonghorn@yahoo.com

Worcestershire

Contact: Mark Perman
Email: liz.mark@virgin.net

Pete's Rockets

The UK High Power and Model Rocket Specialist

Pete's Rockets now carry a HUGE range of kits, motors, electronics and accessories at our 'rocket shop' including:

- ***Vaughn Brothers Rocket Kits***
- ***AED 'RDAS' flight computers***
- ***RATT-Works hybrid rocket motors***
- ***MENTAL 29mm minimum diameter fibreglass rocket kits***
- ***G-Wizz accelerometer / altimeters***

RDAS Flight Computer, NOW in stock!

Call us on: 01529 460 279
e-mail us: davy@btinternet.com

Come and browse through the UK's largest selection of model and High Power rocketry merchandise at our shop and showroom!

The shop is situated in Heckington, near Sleaford, Lincolnshire just off the A1